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This month

India International Seafood Show 2001 3

The biennial trade expo of the millennium was held in Visakhapatnam. A report and recap of the seafood trade fair

Australia initiates interim measures 13

The intent of the new measures is to continue to allow green prawns to be imported that are genuinely destined for human consumption.

Disease problems in shrimp aquaculture 15

Aquaculture has recorded a growth rate of 160% annually. A paper on the disease problems, their prevention and control.

Digital developments in seafood processing 21

A major Iceland software company has merged with a Norway company and now they claim to be the largest designer and seller of dedicated fish industry software in the world.

Japanese market for value added shrimp 25

Japanese are good at the software part to fisheries where as India is now at the highest quality hardware sector having 125 highly sophisticated plants of international standard. A paper by M. Shimomura, Executive Managing Director of JMPIA.

Tuna fetches 20 million Yen 33

A single tuna fetched a record 20.2 million Yen in an auction. A brief on the 2,459 ton tuna.

Effect of environmental hazards on the seafood export 35

As a major seafood exporting country, India is much concerned about the quality of the aquatic environment and safety of the seafood products. A study on the hazards.



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INDIA INTERNATIONAL SEAFOOD SHOW - 2001

India International Seafood Show, the biennial trade expo of the millennium was held in the port city of Visakhapatnam from 9th to 11th February, 2001. The event attracted the best ever response from the country and abroad.

The show was jointly organised by the Marine Products Export Development Authority (MPEDA), Ministry of Commerce, Seafood Exporters Association of India (SEAI), in association with the Association of Indian Fishery Industries, the Shrimp Hatchery Owners and the Aquaculture Farmers.

Over 900 Indian delegates, including 300 aquaculture farmers and 100 foreign delegates from European Union and countries like Japan, United States, Thailand, Vietnam, China and Iran attended the Fair.

The trade expo was inaugurated by the Hon'ble Union Minister for Rural Development Mr. Venkaiah Naidu. In his inaugural address he assured that he would strive to get the Aquaculture Authority Bill passed by the Parliament at the earliest. The Minister emphasized the need for technology upgradation to exploit the huge untapped marine resources.

The farmers should divert from farming to trade. Value addition and retail packing can increase the international markets. Improved machinery should be introduced and for this MPEDA can play a major role, the Minister added.

We should have a thorough market

information so that we can identify the international markets. The Minister cautioned that the conservation of the marine resources should be ensured at any cost.

In his presidential address, the Commerce Secretary Mr. Prabir Sengupta observed that the performance of the seafood industry is really impressive. He emphasised the need for a composite medium term strategy with the compo-

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from European Union
and countries like
Japan, United States,
Thailand, Vietnam,
China and Iran
attended the Fair**



nents of diversification of sources of supply, value addition, development of inland water fishery and conservation. The brand equity of seafood exports should be developed through brand equity fund, he said. To him infrastructure development is the most important area. If we are clear in one strategy, finance will not be a problem, he added. He assured all sort of facilitatory measures to the industry by the Ministry.

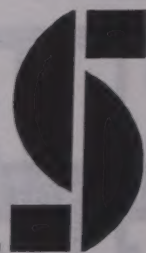
The Souvenir brought out in connection with the Seafood Show was released by Mr. Vadde Sobhanadeeswara Rao. Hon'ble Minister for Agriculture and Horticulture of Andhra Pradesh. He said that Andhra Pradesh commands a good share in aquaculture and it is expected to go further in view of the increase in the cultivation of scampi. He added that the aquaculture bill should be passed at the earliest and this will help the growth of the industry in a scientific manner.

In his welcome address, Mr. Jose Cyriac, Chairman, MPEDA emphasised the vast potential of Andhra Pradesh in the seafood industry.

Mr. R. Bhattacharya, Vice Chairman, MPEDA, presented a report on the industry scenario. He hoped that this 6000 crore industry will grow into 15000 crore industry in another three years time.

Mr. Venkaiah Naidu presented the Friend of India Award to Messers Hanwa and Co. of Japan, Red Chamber of the United States and Launder Limited of the United Kingdom. The lifetime contribution to the seafood industry was posthumously conferred on Mr. C. Cherian and Mr. P. C. Cherian, son of late Mr. C. Cherian received the award from the Hon'ble Minister. The Minister also presented the MPEDA export awards for 1998-99 and 1999-2000. Mr. Elias Sait, President SEAI delivered the vote of thanks.

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Hon'ble Minister for Fisheries and BC Welfare Mr.N.Narasimha Rao, Minister for Forests Ch.Ayyanna Patrudu, MPs Mr.G.Rammohan, Mr.M.V.V.S.Murthy and Mr.Prabhath Samanthray, Mr.Bharath Bhushan, Joint Secretary, Ministry of Commerce, Mr.K.Hari Babu and other industry representatives participated in the function.

The exhibition was opened by the Hon'ble Union Minister Mr.Venkaiah

Naidu.

The industry emphasized the growth of the Indian Marine product export business. Huge potentials are yet existing which can be tapped only with a favourable environment from the central government. The industry acknowledged the contribution made by Andhra Pradesh, which accounts for 50 per cent of the total 2500 crores exports generated by the aquaculture sector

and Rs.800 crore from deep sea fishing.

The delegates discussed the issues of common interest in the business session, which covered aquaculture, fishing, banking, finance and insurance and value addition.

The Show came to an end on 11th February, 2001 and for the host state, the show brought to focus to importers the potential that the state is having for the growth of the aquaculture sector.

CIFT conducts short-term training courses

Central Institute of Fisheries Technology, Kochi has planned to conduct eleven regular training courses as given in annexure-I for the benefit of technical personnel working in the various fish processing units, govt. officials and other interested entrepreneurs during the next six months.

It is requested that suitable candidates may kindly be sponsored by their organisation for any of these training courses. The nomination form may indicate the training course in which the candidate is interested. Interested candidates may provide their biodata viz. Name and Designation, Age, Educational qualifications, Experience and

Training courses attended during the last three years. Based on the number of candidates applied for each training course, the dates of training for these courses will be finalised and further details will be sent. Training fees need not be sent along with the nominations and could be paid before the commencement of the course.

ANNEXURE-I

Sl. No.	Title of training course	Duration	Fees (Rs.)	Participants
1.	Training course on fishing technology	2 weeks	3000	Govt. officials
2.	Seafood quality assurance	2 weeks	3000	Technologists
3.	Laboratory Techniques for identification of bacteria in fish and fish products	12 days	2000	Technologists
4.	Training in fish processing technology	2 weeks	4000	Technologists
5.	Training on HACCP concepts	1 week	3000	Technologists
6.	Training course on modern analytical techniques in biochemistry	2 weeks	5000	Research Scholars/ Technologists
7.	Training in value added fishery products	1 week	4000	Technologists
8.	Production of battered and breaded fish products	4 days	3000	Technologists
9.	Public health and hygienic practices	1 week	2000	Technologists
10.	Training course on fishery technology and extension methods	2 weeks	2000	Govt. officials
11.	Training course on operation and maintenance of cold storage plant	1 week	2000	Officials/Technologists

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INDIA INTERNATIONAL SEAFOOD SHOW - 2001



*Hoisting of the National Flag by the
Hon'ble Minister Venkaiah Naidu*



A view of the trade fair grounds

*Hearty welcome to all from the
Chairman, MPEDA ▶*



*Inauguration of the Seafood
Show by the Hon'ble Minister
Venkaiah Naidu ◀*



Mr. Vadde Sobhanadeeswara Rao, Hon'ble Minister for Agriculture and Horticulture of Andhra Pradesh releasing the Seafood Souvenir



Award for the lifetime contributions of Mr. C. Cherian. Mr. P.C. Cherian receiving the award from the Hon'ble Minister



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Niranjan S. Mathani of Crown Frozen Foods receiving the award from the Hon'ble Minister



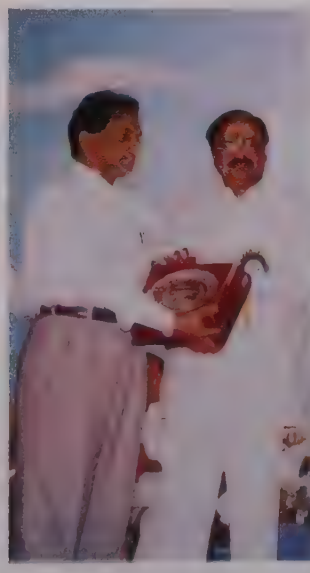
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Falcon Marine Exports Ltd.



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Inauguration of the Exhibitions



Mr. Prabir Senguptha, Commerce Secretary visiting the stalls



A view of the audience



From the cultural programmes



◀ Business Session on Banking, Finance and Insurance

Ms. Sashi Sareen, Director EIC in the Business Session on value addition ▶



◀ Business Session on aquaculture

Business Session on fishing ▶



◀ Elias Sait, President, SEAI addressing a business session



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Australia initiates interim measures for importation of green (uncooked) prawns



The intent of the new conditions is to continue to allow green prawns to be imported that are genuinely destined for human consumption, and to eliminate importation of green prawns which are declared as being for human consumption.



Imports of green prawns for any use now require an import permit. Previously, green prawns could be imported without an import permit if intended for human consumption. The tariff profiles have been amended to direct all consignments of green prawns to Australian Quarantine and Inspection Service (AQIS).

The intent of the new conditions is to continue to allow green prawns to be imported that are genuinely destined for human consumption, and to eliminate importation of green prawns which are declared as being for human consumption, but are actually intended to be sold as bait. The practice of imported green prawns being sold for bait increases the risk of introducing exotic prawn diseases into Australia's prawn populations.

The general conditions for the importation of green prawns for human consumption are described in ABPM 2000/57. Importers must apply to the Biologicals Unit for an import permit. The application form can be found on the internet at www.affa.gov.au/docs/border/option_c.doc. The form may also be obtained through any AQIS regional office.

An assessment fee of \$60 must accompany the application. Cheques, Bankcard, Mastercard, Visa and American Express are accepted. The application should be forwarded to the Biologicals unit by fax (02 6273 2097) or posted to PO BOX 858 Canberra ACT 2601.

If consignments arrive without an import permit, AQIS will apply conditions of entry at the border which will provide an equivalent level of certainty that the imported green prawns are for human consumption and not for bait.

Clearance procedure for whole green prawns from new caledonia and peeled green prawns (including produce with tail fan and shell on final segment) and further processed product from any country

Prawn populations in New Caledonia are considered by AQIS to have the same health status as Australian prawn populations and not likely to introduce exotic prawn diseases. Peeled green prawns and further processed product are unlikely to be used for bait or aquaculture and therefore do not need to be inspected on arrival to ascertain end use. Examples of further processed green prawn products include uncooked battered or crumbed prawn cutlets or prawn meat. Consignments may be cleared on the basis of the following documentation:

1. Commercial invoice or packing list identifying the product as of New Caledonian origin,
OR
2. Commercial invoice or packing list describing the product as peeled or as further processed green prawn product (eg crumbed green prawns) with a relatively high commercial value.

Clearance procedure for imported whole green prawns

Prior to release from quarantine, all consignments of whole or headless unpeeled green prawns must be inspected by AQIS (full unpack at a cold store), apart from prawns from New Caledonia. The purpose of the inspection is for AQIS officers to satisfy themselves that the imported green prawns are intended for human consumption and not for bait or for aquaculture feed.

Whole prawns for human consumption would reasonably be expected to be:

1. Graded so that they were consistent in size.
2. In packaging/boxes marked with the graded count size, the graded count being not more than 29 to the pound, or 66 to the kilogram (eg. 10/15 prawns to the pound, or 22/33

Contd. on page 42

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Disease problems in shrimp aquaculture - their prevention and control

L. Karunasagar and Indrani Karunasagar*

Fish production by capture has been stagnant world over and therefore, to improve fish production, aquaculture is very important. During the last decade, aquaculture has been the fastest growing industry in the food sector recording a growth of over 160% annually. However toward the middle of 90's, shrimp aquaculture faced serious problem due to viral diseases. Drastic reduction in shrimp production was recorded in China, Indonesia, Philippines and India. In Asian countries, annual losses due to disease problems has been estimated to be more than US \$ 3,000 million. Most disease problems may be caused by bacteria, viruses, fungi or parasites. Most serious problems are due to bacterial and viral diseases. For management of disease problems, early detection of pathogens would be very important. Recently molecular techniques have been found helpful for detection of pathogens at subclinical stage and also to identify carriers of infection. Disease management strategies should be based on the premise that interaction of host, pathogen and environment play a crucial role in deciding the health status. Strategies suggested include avoidance of pathogen and its carriers, improvement of host conditions through immunostimulation and management of pond conditions.

Strategies to avoid pathogens

An ideal strategy for prevention of



d) Avoidance of water contaminated with pathogens.

e) Elimination of pathogens from the culture environment using probiotics and biocontrol agents.

Diagnosis of disease

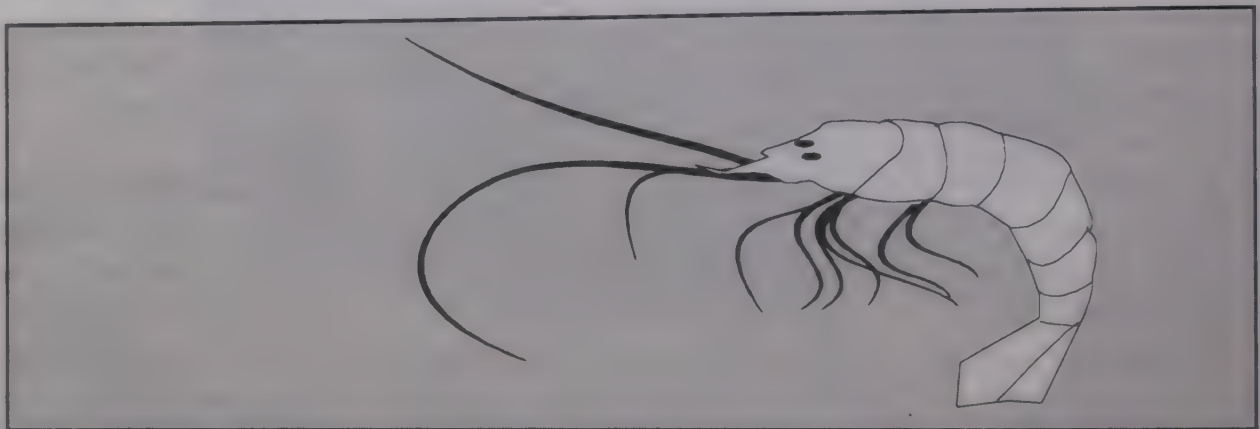
For effective management of disease problems, rapid diagnosis at an early stage is very essential. The disease which is causing major problem to the aquaculture industry is a viral disease called white spot disease. There is no known treatment for viral disease even in mammalian systems. The best solution to the problem of viral disease is to avoid the virus in aquaculture systems. However, the whitespot virus has already affected the natural brood stock in the sea and a number of marine crustaceans. Most often, the brood stock and other marine crustaceans do not show any signs of disease, but they carry the virus which remains dormant or latent in these animals.

To avoid viruses in aquaculture system, it is important to identify brood stock carrying the virus and to avoid their usage in hatcheries. It is also necessary to be able to find out whether post-larvae used as seeds by shrimp farmers carry this virus. To achieve these, the Department of Fishery Microbiology of the College of Fisheries has developed a very rapid and sensitive DNA based diagnostic test called "Polymerase chain reaction (PCR)". Using this test, it is possible to detect even dormant viruses in apparently

disease would be to avoid pathogens in shrimp culture environment. This is however difficult to achieve. Most often disease problems are caused by pathogens which are naturally present in sea water. For eg. the luminous bacterium causing problems in hatcheries and growout ponds are commonly present in sea water and in association with broodstock. Even pathogenic viruses such as WSSV and MBV may be present in apparently healthy broodstock. Recent studies have shown that WSSV has a very wide host range and may be present in a number of crustacean species including shrimps, crabs, zooplankton and even aquatic insects. Therefore for avoiding pathogens, some of the measures which can be taken are

- Rapid detection of pathogens in broodstock, larvae and carrier animals even before they show signs of disease.
- Avoidance of broodstock and larvae carrying latent or dormant pathogens.
- Identifying and excluding carriers of pathogens from the culture environment.

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Strategies to improve water quality and reduce stress

One of the most important causes of stress to the animals in a culture pond is the deterioration of water quality. This happens due to improper degradation of wastes in the pond.

Shrimp excreta, exoskeleton shed during molting- all these contribute the organic water accumulating in the pond. These are utilised by microorganisms present in the pond to produce toxic end products such as ammonia and hydrogen sulphide. Such toxic substances cause stress to the animals and make them susceptible to pathogens lurking in the environment or present in a dormant state in the host itself. To prevent environmental stress to the animals, it would be important to degrade the toxic waste products. Microorganisms are highly versatile and can utilise toxic substances such as ammonia and hydrogen sulphide and convert them to less harmful nitrate and sulphate. The concept of cleaning the environment using microorganisms has been around for sometimes and the term "bioremediation" is used to describe the process of converting the environmental parameters to favourable levels using microorganisms. The Department of Microbiology of College of Fisheries, Mangalore has been trying to apply this concept of bioremediation to aquaculture systems. The Department has a collection of microbial cultures which can quickly convert ammonia to nitrate, hydrogen sulphide to sulphate and improve the water quality and sediment quality in aquaculture systems. Laboratory studies have clearly shown that these microbial consortia can correct water quality in shrimp ponds.

Development of probiotics

The term probiotic has been used to describe microorganisms which have a

lems and growth promotion. Probiotic microorganisms may eliminate pathogens by competitive exclusion or by production of antibiotic like substances or through induction of non specific defence mechanisms.

Methods to boost the natural defence system of shrimp

Though PCR test is helpful for testing the seeds for the presence of virus, this is not an end by itself. Disease outbreaks may occur even in ponds stocked with PCR negative seeds. Whitespot virus may enter culture system through various carrier animals wild shrimp), water etc. To improve the disease resistance of shrimp, the Department of Microbiology has developed an immunostimulant which contains yeast and bacterial cell wall components. Laboratory studies have shown that treatment of shrimp with immunostimulants can enhance their resistance against both bacterial and viral pathogens. However, in shrimp, the immune system is rather poorly developed and therefore, treatment with immunostimulants should be made every 4th day. The immunostimulant will boost the natural defence systems of shrimp against diseases. Thus the immunostimulants do not have any harmful or residual effects on the shrimp.

healthy animals. To draw samples for this test, it is not necessary to kill the brood stock. A sample of walking leg or swimming leg of the brood stock is enough to test for the presence of the virus. PCR test can also be used to screen batches of post-larvae for the presence of latent viruses. It is now becoming common that farmers or hatcheries draw samples postlarvae from the tanks and them to the College of Fisheries testing for white spot virus. The test developed by the Microbiology Department is called "nested PCR" and this test is much more (above 1000 times) more sensitive compared to normal PCR. With this test, it is possible not only to detect latent viruses, but also to grade the degree of infection in the animals. The "nested PCR" is done in two stages. If the test animals have high load of virus, the test comes out positive at first stage. On the other hand, if the viral load is very low, the first stage test will be negative, but the second stage test will be positive. Due to the extensive presence of the white spot virus in marine crustaceans, only a small percentage of larval samples are generally negative by nested PCR. When postlarvae are negative by the first stage reaction and positive by second stage, it would be possible to use them for stocking ponds. However, pond conditions should be managed well to prevent stress to the animals, so that the virus does not gain upper hand. On the other hand, when postlarvae are positive by one step PCR, the risk of disease outbreak is higher.

Use of probiotics to eliminate pathogens

Probiotics have been in use in veterinary practice for a long time and the benefits accrued include improved food absorption, reduced pathogenic prob-

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favourable effect on the host. In veterinary practice, lactic acid bacteria have been used for a long time to prevent colonisation of animal systems by pathogens such as *Salmonella*. Presently, the Department of Microbiology, College of Fisheries has been working towards development of probiotics useful in aquatic animals. Studies conducted so far show that some marine bacteria have antagonistic activity against *Vibrio* spp which are pathogenic to shrimp. Such marine bacteria have potential for application as probiotics in shrimp culture ponds. Trials of these probiotics are being conducted in ponds to see the extent of benefit which probiotics can confer to shrimp survival and growth.

Research to help carp culture

Culture of Indian major carps is contributing significantly to fish production in India. In Andhra Pradesh,



nearly one lakh hectare has been brought under fresh water fish culture. In carp culture, one of the major pathogens is a bacterium called *Aeromonas hydrophila*. This organism can cause number of disease conditions such as haemorrhagic septicaemia, dropsy, ulcerative conditions etc. These organisms may also cause secondary infections following injury inflicted by par-

asites. The Department of Fishery Microbiology at the College of Fisheries has been working towards developing a vaccine for this organism. Unlike shrimp in which a specific immune system has not yet been demonstrated, fish can mount a specific immune response against particular pathogens and therefore, one can think of developing vaccines for fish. The problem with *Aeromonas hydrophila* is that it is a heterogenous group made of several serotypes within a single species. The vaccine developed at the Department of Microbiology is a polyvalent vaccine which can protect against number of different serotypes, further research on this organism is focussing on identifying a protective antigen in this organism which can be used as a vaccine.

** Department of Microbiology,
College of Fisheries,
Mangalore - 575 002.*

FDA ANNOUNCES ADVISORY ON METHYL MERCURY IN FISH

The Food and Drug Administration (FDA) is announcing its advice to pregnant women and women of childbearing age who may become pregnant on the hazard of consuming certain kinds of fish that may contain high levels of methyl mercury. The FDA is advising these women not to eat shark, swordfish, king mackerel, and tilefish. As a matter of prudent public health advice, the FDA is also recommending that nursing mothers and young children not eat these fish as well.

Fish such as shark, swordfish, king mackerel, and tilefish contain high levels of a form of mercury called methyl mercury that may harm an unborn baby's developing nervous system. These long-lived, larger fish that feed on smaller fish accumulate the highest levels of methyl mercury and therefore pose the greatest risk to the unborn child. Mercury can occur naturally in the environment and it can be released into the air through industrial pollution and can get into both fresh and salt water.

The FDA advisory acknowledges that seafood can be an important part of a balanced diet for pregnant women and those of childbearing age who may become pregnant. FDA advises these women to select a variety of other kinds of fish — including shellfish, canned fish, smaller ocean fish or farm-raised fish — and that these women can safely eat 12 ounces per week of cooked fish. A typical serving size of fish is from 3 to 6 ounces.

The FDA's Center for Food Safety and Applied Nutrition will launch a comprehensive education program to reach pregnant women and women of childbearing age who may become pregnant and their health care providers concerning the hazard posed by methyl mercury to the unborn child. As one of its priorities for fiscal year 2001, the Center will also develop our overall public health strategy for future regulation of methyl mercury in commercial seafood.

Today, EPA is also issuing advice on possible mercury contamination to women and children eating fish caught by family and friends (non-commercial fish). EPA particularly recommends that consumers check with their state or local health department for any additional advice on the safety of fish from nearby waters. Additional information is available on EPA's Web site at: HYPERLINK "<http://www.epa.gov/ost/fish>" <http://www.epa.gov/ost/fish>.

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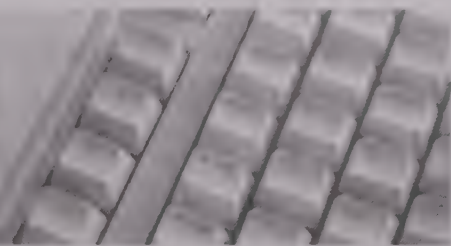
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Digital developments in seafood processing



In July 2000, TM Software of Iceland (www.tm.is) merged its Business Solutions Division with MarEx of Norway to create MTS Software, which now lays claim to the title of the largest designer and seller of dedicated fish industry software in the world.

Besides its dual home market of Iceland and Norway, MTS operates subsidiaries in the USA, Canada, Scotland and the Faroe Islands. And prospects in the North American fisheries are looking good. This summer MTS Canada earned the title 'Rookie of the Year' as best new sales performer from Danish business software company Navision Financials on which its systems are based.

Like TM, MarEx has specialised in fisheries, both in fish farming software based on Navision Financials and business-to-business solutions for fish trading.

TM's fisheries flagship is the WiseFish system, which offers a complete integrated package of modules for managing fish handling from the moment of catch to delivery to the customer.

In recent years several major Icelandic software solution providers have merged under the TM umbrella, as well as dedicated fisheries high tech ventures such as Origo, which has been developing a new objective quality system under the EU-funded QimlT project.

Manageable and Traceable

WiseFish comes in separate modules-WiseTrawler, WiseFishing, Wise Processing, WiseQuality and Wise Sales - for managing different aspects of the physical and business side of fishing and fish processing, and they all integrate seamlessly so that information only needs to be recorded once to be available throughout the system.

This interaction of all data provides users with a complete but manageable overview of the whole processing operation with particular benefits not only for monitoring efficiency along the line but also for traceability, a vital consideration in today's quality-conscious market place.

In WiseFish, raw material can be defined in terms of either origin or

In recent years several major Icelandic software solution providers have merged under the TM umbrella, as well as dedicated fisheries high tech ventures such as Origo, which has been developing a new objective quality system under the EU-funded QimlT project.



processing lot, or both. This might be a particular fishing ground, fish market, or container in processing, subdivided into species and grades if required.

Processors can then track the raw material's progress in detail as it is processed into products, assigned to pallets and booked onto invoices. All inputs are accounted for and can be traced back to a particular date and location in the value chain in the event

of complaints.

Secondary inputs such as packaging can be entered into the system and the inventory record is automatically updated when they are allocated to products. Also, orders can be booked by committing specific products to a buyer even before processing is completed.

Another of the many powerful WiseFish features calculates product yield, production performance and contribution margin (gross profit) from cost and sales price data. This is shown both in real time, and an experimental mode where the user can see the effect that changes in yield and performance would have on profit.

'Leader of the Pack'

Digital technology is essentially all about abolishing the boundaries between different media for presenting information, and electronic equipment and the software used for managing the data from it are really two sides of the same coin. No where is this probably clearer than at Marel, where a recent focus has been on development of software for user-friendly control of the equipment on which the company built its name.

Marel (www.marel.com) began back in the 1970s with designs for electronic scales and later transferred the principle to on-board weighing equipment, a field where it now accounts for about half the world market. Other milestones include dynamic flow weighing and computer vision systems.

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While Marel has been regularly upgrading its equipment to enhance weighing precision, speed and flexibility of applications, its latest big innovation is in a new and user-friendly Windows interface or PCs, the MPS system unveiled at last year's Icelandic Fisheries Exhibition.

The MPS range comprises several modules for grading, packing, stock, process overview and timekeeping, which can operate as stand alone units or combined into a comprehensive information management system. Each module gives the user control over specific parts of the fish processing operation, delivers real-time information and generates a wide range of reports.

MPS Grading, for example, connects to all Marel graders and allows users to monitor batching and grading performance and yield, and to adjust the parameters and settings if predetermined requirements are not being met. Data can be displayed, not just in figures, but in easily readable graphics diagrams and reports.

Promoted as 'Leader of the Pack', MPS OptiPack, another new module in the series, offers a wide range of labelling options, real-time inventory and stock control and full product traceability features. It supports both check scales and active packing graders, meaning that products can be sent for storage or distribution immediately after weighing or grading. An automatic palleting function either directs the products to a suitable pallet, or creates a new one for it, on a per-order, per-product or per-inventory basis.

OptiPack systems have already been installed in countries as far a field as the Faroe Islands and New Zealand.

Combining the features of Marel's earlier packing and marine modules, MPS OptiPack was designed partly to meet the need for an independent packing solution to fit a whole-salmon grad-

ing and packing system which was launched last year. Marel is continuing to add refinements to its salmon processing equipment, most recently with trials of an infeed system which automates the processing stage between bleeding and gutting, thereby cutting manpower requirements and boosting process synchronisation.

The Marel Group operates seven subsidiaries in Europe and the USA, the largest being Carnitech of Denmark, which it acquired in 1997.

Pols Moves into Pelagics

Pols of Isafjordur (www.pols.is) in Iceland's West Fjords also developed from the new wave of electronic technology in the late 1970s, and offers a full range of graders and on-board scales. Exports account for more than 65% of sales of Pols and since 1996 the company has had a special focus on Norway where it has been working on new design in collaboration with fisheries companies there.

The latest Pols product, unveiled this year, is a Flow Portioner using patent-pending technology for accurate, high-speed batching of pelagics. Developed entirely in Norway during the past two years, the Flow Portioner 'offers a new combination of capacity and accuracy for pelagics processing', says Pols managing director Orn Ingolfsson.

It can handle up to 12 t of herring an hour using a two-channel configuration, with an accuracy of +1% for 10-20 kg packages, thereby minimizing product giveaway and eliminating the risk of blockage problems during plate freezing.

Working Out 'What if?'

Countless processing managers are surely familiar with the feeling of watching the computer automatically recording production and accounting figures, while they scratch their heads and wonder 'What if?'. Reykjavik-based BR Solutions (www.br.is) addresses just that

problem with a series of decision-support programs, which use optimisation principles to calculate the most efficient and profitable combination of results for any given assumptions.

BR presently offers OperationOpt, a long-term system for fishing operations management and two systems for day-to-day or weekly decision-making-GradeOpt and ProcessOpt. Users can define as many parameters as they want and to take ProcessOpt as an example-enter historical data (gathered by other computer systems or data collection devices) on raw material and product prices, available catch for processing, wage costs, etc.

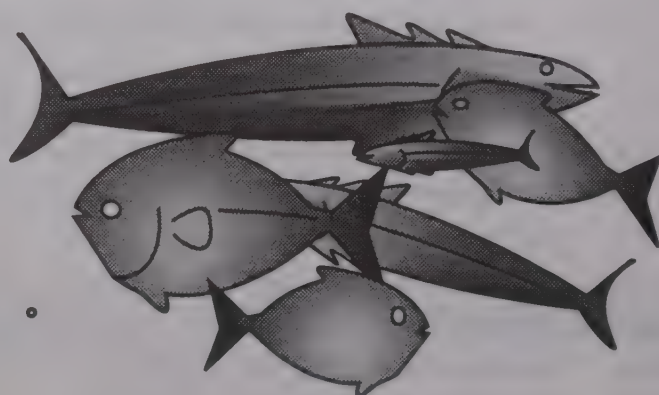
Adjusting one parameter, for example the price of a single species, will then change the other values and the program will come up with a new, optimised production schedule for maximum profitability. It delivers information such as how much extra catch of a given species you should buy in from a market or vessel to utilise capacity or meet orders, and how much more profit you will make if you do so.

The BR GradeOpt program can be used for deciding where to set limits for size or weight grading of species such as shrimp, herring and mackerel in order to maximise production value. In all programs, optimisation proposals are backed up by easy-to-understand graphical models such as pie charts and graphs.

'This system really takes over where conventional ones stop,' says Johannes E Levy of BR Solutions, 'and we developed ProcessOpt from an idea begun by a trawler company manager. So although it uses sophisticated business management mathematics, it's actually born from within the industry itself,' BR optimisation programs are in use at several fisheries sector companies in Iceland, and are now available in English and Norwegian as well.

Courtesy: Seafood International

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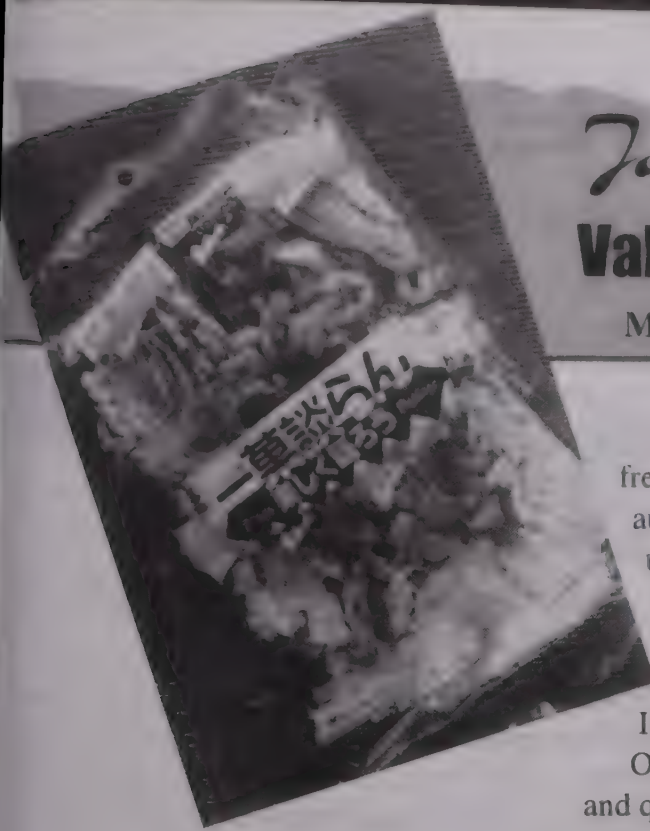
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Japanese Market for Value-added Shrimp & Cephalopods

M. Shimomura*



freshness of the product, when it is auctioned, in the market. The meticulous care he takes in handling, sorting, preserving and transporting in insulated fish box is to be modelled out by the fishermen in India.

Once you take care of the freshness and quality of the product at the catching stage itself, you can avoid investing heavily on the Hardware part. On the other hand, whatever investment you make on establishing an air-conditioned Hardware, will be of little use, if the raw material is of low quality, on-board the craft at catching site. This is the most important fact to be borne in mind, while embarking upon any improvement plan in the Fisheries field, so that your attempt to penetrate into the Consumer market in Japan becomes much easier.

You can Add Value to your products by maintaining the freshness and quality of raw material and not by packing in tray/tetra packs.

An Outline

Summary

The final statistics of fishery products import of Japan in 2000 has not been announced yet. But it is estimated that the amount reached 9,500 million tons, 17 trillion yen, that is about 16 billion dollars. In comparison with that of the previous year, the quantity increased by several percent, which is the second high result next to that of 1995. And the value was similar on the yen base, a little high on the dollar base, which is respectively 3rd or 4th high.

In 1995, the yen was strong, when 1\$ was about 83 to 100 yen, then, however, the yen became weaker. In 1997, 1\$ was 114 to 127 yen, in 1998, from 120 to 140 yen. And from the last part in 1998, the yen became stronger a little. In 1999, 1\$ was from 120 to 104 yen, in 2000, from 104 to 108 yen. Last month, the yen became much weaker, and now, 1\$ is around 120. With various factors interacting in this background, the Japanese economic power, and the cost of other food products, the amount of fishery products import in Japan have been changing.

In 2000, the imports of such items as Mackerel, Sardine, and Horse mackerel, (these are called 'Blue fish' and 'Pelagic fish') in Japan, have increased, and so have the imports of Tuna, Octopus, Flatfish, Sea crawfish and Eel.

The status of the best 10 items

As to the quantity of fishery products import, the best 10 items are Fishmeal, Tuna, Shrimp, Salmon and Trout, Surimi of Codfish, Crab, Octopus, Skipjack and Flatfish and Flounder. They occupy half of the whole quantity.

Though these items rank have been changing one after another each year, the best 4 items have not changed since 1992.

As to the total value of imports, the best items are Shrimp, Tuna, Salmon and Trout, Crab, prepared and preserved Eel, Pollack ross (fresh, chilled and frozen), Octopus, Pearl, prepared and preserved Shrimp, and Surimi of Codfish, in this order. These items occupy 60% of the value of imports. And the best 5 items have not changed for these 10 years.

India, as of today, is in the forefront in Information Technology. It is a fast growing economy which could reach the heights of glory in a short span of time. The capabilities of India in Software is highly appreciated by the world community. The Japanese also have come to realise the potential of India in the field of IT and Software, as it is of superb quality.

While Japan is in the forefront in Computer Hardware, Japan is very weak in the Software sector. Once India join hands with Japan in the field of IT, it could be possible to create a formidable force in this field, surpassing USA or any other nation in the world.

Similar is the situation in the field of Fisheries. Japanese are good at the software part to Fisheries, whereas India is, now, at the highest quality hardware sector, having nearly 125 highly sophisticated processing entities of international standard, as approved under the EU Norms and HACCP & USFDA.

But there needs to be a qualitative approach towards the Software part, i.e. the raw material quality.

The Japanese fishermen give value to each and every fish they catch and preserve it in live or chilled condition, on-board the vessel so as to keep the

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The status of imports from major countries

As to the quantity of fishery products import, China has been the top country of exporter to Japan. The other main countries are USA, Chile, Norway, Russia, Thailand, Korea, Taiwan, Indonesia, Peru, India and so on.

The Import Performance

Shrimp

The total quantity of Shrimp is about 300,000 tons.

As to the main exporter to Japan, Lobster was imported from Australia, Cuba, Canada, USA, Chile and China. Live Shrimp and Prawn were about 250,000 ton, from India, Indonesia and Vietnam. Dried or Salted are from China, Vietnam and so on. Looking at the quantity, the top were India and Indonesia, both of each with 50,000 tons. Other countries are Vietnam with 30,000 Thailand with 20,000, China, Canada, Greenland, respectively with about 10,000 and Philippines, Russia, Australia, Ecuador and so on.

The total quantity of import of Shrimp tend to decrease, in comparison with that in 1994, the peak year, its quantity was 300,000 tons. It is due to the decrease of import from Thailand. Thailand has exported more to USA than to Japan since 1992. Then that quantity has increased year by year. At last, in 1999, that of Lobster for USA was about 110,000 tons. Not only Thailand but also China, Indonesia and Bangladesh have exported more and more Shrimp to USA.

Octopus, Cuttlefish and Squid

The total quantity of related items of Octopus, Cuttlefish and Squid was 226,000 tons.

As to Octopus, the main exporters to Japan were Morocco, Mauritania, Canary Island, Gambia and Vietnam.

Cuttlefish (*Sepia officinalis*) were from Morocco, Thailand, Mauritania and India. Cuttlefish were from Thailand, Vietnam, Malaysia and China.

Squid (Sea-arrow, flying squid, broad

squid) were from Thailand, USA, Vietnam, India and Korea.

As to Northern shortfin squid were from Korea, Taiwan and Argentina

The canned one were from Thailand and Vietnam, and the prepared and preserved one were from China, Korea, Thailand, Vietnam and so on.

Size and volume of value-added products in import into Japan.

The shrimp and cephalopods, imported or domestically produced, are marketed in live, fresh, chilled and consumer packs, mostly in tray packs, through Chain Stores, Convenience Stores, Super Markets etc. As could be seen from the Data sheet, the share percentage of value added shrimp against imports, has been consistently growing for the past few years. It has grown from, 7.9% in 1997 to 11.4% in 2000, whereas in the case of Cephalopods, it has grown from 10.8% in 1997 to 18.4% in 2000, an appreciable growth.

The importers in Japan are slowly expanding their manufacturing process to other countries through joint ventures or marketing tie-ups. Indian processors should also be able to enter into such joint ventures in the production and marketing of value added products, by creating confidence in Japanese buyers with regard to maintaining consistent quality. Once quality becomes the Hall-mark of Indian Seafood Industry, India can reasonably expect a fair share of Japanese market.

The Import of Fishery Products from India

Japan has imported fishery products from India, which reached around 60,000 to 70,000 tons.

Among that, Shrimp occupy around 75 to 80% and Squid are 5 to 7%. The amount of Frozen shrimp has occupied more than 70% of total amount of import. Recently, the prepared and pre-

served shrimp are getting increased share, but that has not become stable yet. However, with comparison to the simply frozen one, those are reasonable. So, India would like to put much value on shrimp products and export more from now on.

The import of Squid and Cuttlefish has decreased, from 6,200 tons in 1996, the peak year, to about 3,000 tons in 2000. The main species are Squid, Spear squid and Broad squid, most of which are fresh. The demand for Squid has been decreasing. The trend we can see in other countries also.

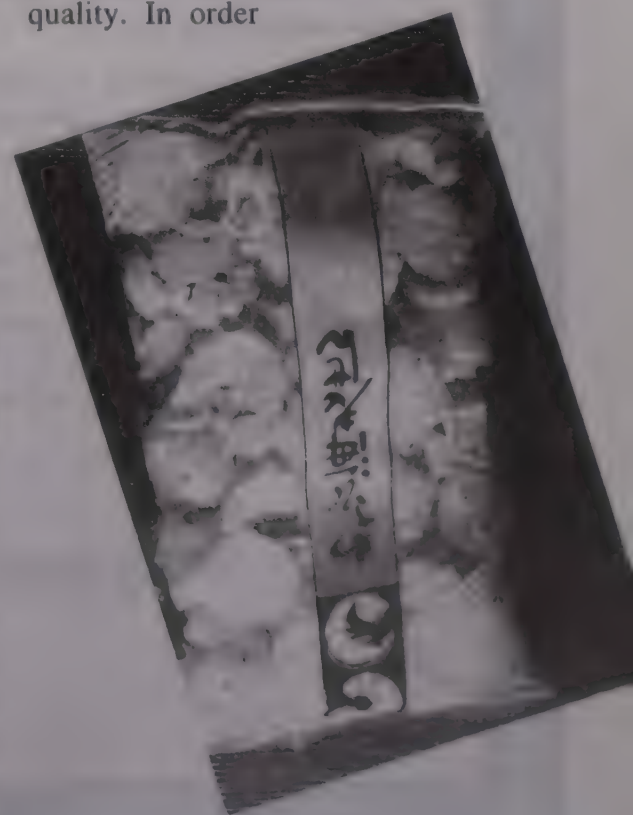
Talking about other imported items, the Surimi of Golden threadfin-bream has been increasing since 1997 year by year, from 6,000 in 1999 to 7,000 in 2000.

Frozen Spiny lobsters have been imported from 600 to 900 tons.

The others are Honnible croaker, Largehead hairtail, Tuna, Octopus, Bivalves and so on.

The Points of Quality Problem

The food safety demands requires high quality worldwide. Exporting products, are strictly checked, especially on the hygiene control and raw material quality. In order



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With a booming market in seafood across the globe, Alsa Marine has responded suitably with collaborations and joint ventures.

Alsa Marine has state of the art cooking and freezing plants at Calcutta and Vizag and the plant at Chennai will be ready in six months. Leased plants at Bhubaneswar, Chennai and Cochin have also been upgraded. Alsa is on a list of USFDA and two of its factories are approved for BEC.

Equipped with state of the art facilities and a

trained workforce, Alsa is poised to rapidly forge ahead into the future through a forceful expansion cum modernisation drive, at home and abroad. Alsa is recognised as a Trading House and is geared to attain Star Trading House status in the coming years.

Alsa Marine manages a 120 acre farm in Nellore, and is also an active participant in satellite farming. With a tie up with Biofeed Singapore, Alsa has brought in quality feed to the small and big farmers. Alsa Marine provides technology for different levels of culture activities; from the semi-intensive to extensive. Alsa Marine assists farmers in setting up of farms, right from selection of site to commercial operations and provides farm management assistance.

All of which will see Alsa netting more profits and precious foreign exchange from the seas.



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BRINGING ASHORE THE PROSPERITY OF THE SEAS.

to export to Europe and USA, exporters must acquire the ISO and the HACCP.

Though such qualifications are not required for exporting the fishery products to Japan, most Japanese consumers require high quality of products, which is on a different standard from ISO and HACCP for Europe and USA. In addition to that, the Food Hygiene Law and Health and Welfare Ministry of Japan demand a little different standard from Europe and USA, which is for hygiene and safety of food. So Japanese importers want the fishery products on high hygiene and quality, especially raw material quality with which Japanese Government and consumers would be satisfied.

For the law and the guideline of the Ministry, in the case when some kind of medicine like antibiotic or non-eatable things are applied to producing shrimps, the importers make it a rule to recall or send back all such products to the exporting country under the Recall Law.

Here is a paper which summarize the quality standard of frozen shrimp import.

That hygiene and quality which India and Japan have to achieve are for all the fishery products from India, not only for the shrimp. Then we make a good business deal to trade.

The export from now on

Today, in Japan, the number of people with one family have become smaller than before. As a matter of fact working women are increasing. Besides, the ratio of the elderly people in population has also been increasing. These things make more Japanese people dine out or buy ready-made food easily.

On the other hand, the social labour situation is changing, that is the young Japanese people are not willing to work in the hard circumstances. So, the demand of prepared and preserved fishery products is growing. Indeed, it is important to supply the fresh material (to export directly the fishery products that you caught), but it is more important to supply the prepared one.

The Results' Change of the Marine Products' Imports from India

Quantity : ton

Value : 1000 US

Year	Quantity of imports from India				Quantity of all imports	
	Quantity	Value	%	Ranking	Quantity	Value
2000	62,149	59,252	3.77		3,195,649	1,569,851
1999	69,107	552,123	3.62	10	3,415,479	15,247,965
1998	65,218	596,019	4.49	9	3,102,566	13,275,830
1997	75,362	674,600	4.17	9	3,410,935	16,178,184
1996	70,541	622,867	3.53	10	3,449,053	17,635,764
1995	56,020	572,622	3.10	10	3,581,099	18,444,744
1994	54,181	539,927	3.22	9	3,294,893	16,753,565
1993	48,164	369,006	2.52	11	3,123,115	14,661,545
1992	40,676	276,132	2.08	12	2,969,334	13,248,041
1991	43,982	308,902	2.47	11	2,850,035	12,521,622
1990	44,566	293,660	2.64	10	2,543,956	11,128,426
1989	37,334	232,324	2.20	10	2,288,231	10,547,860
1988	36,539	277,132	2.54	10	2,414,168	10,934,059
1987	43,416	299,751	3.53	8	2,075,268	8,491,877
1986	42,458	282,262	4.13	8	1,868,520	6,829,636
1985	41,150	232,668	4.71	5	1,577,299	4,940,799
1984	42,213	254,771	5.76	4	1,393,322	4,425,402
1983	39,489	261,862	6.21	4	1,316,293	4,218,798
1982	42,335	285,888	6.83	4	1,202,857	4,186,062
1981	40,950	247,366	6.22	4	1,129,068	3,975,114
1980	36,067	196,963	5.84	6	1,037,350	3,372,677
1979	40,238	255,517	6.00	6	1,151,174	4,256,390
1978	32,795	175,306	5.38	6	1,012,354	3,259,638
1977	26,778	131,228	5.36	6	1,041,169	2,446,518
1976	28,742	138,281	7.28	4	814,516	1,900,225
1975	30,802	93,559	7.22	4	710,394	1,296,575
1974	20,498	59,967	5.38	6	604,117	1,113,934
1973	24,033	65,469	5.90	6	658,428	1,109,305
1972	12,958	40,122	6.49	5	480,661	617,980
1971	9,873	24,926	5.63	5	398,321	442,655
1970	6,480	14,771	4.64	8	374,569	318,412
1969	4,931	11,992	4.60	8	362,628	260,676
1968	3,275	6,621	3.30	10	370,143	200,374
1967	2,357	4,735	2.47	11	330,950	191,573
1966	1,188	1,829	1.09	12	335,030	167,588
1965	884	1,223	1.18	n.a.	278,940	103,950

Note: In 2000, from January to November and the unit of value is 1000000 yen.

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Imported Shrimp & Cephalopods from World to Japan

Shrimp

		1997		1998		1999		2000 (1-11)	
		Q (tons)	V (1000\$)	Q (tons)	V (1000\$)	Q (tons)	V (1000\$)	Q (tons)	V (1000\$)
Peeled tail on	a	14,000	225.671	15,200	245.812	14,500	214.566		
Fresh and frozen total	b	267,681	2,972.369	239,151	2,561.275	247,676	2,481.756	223,890	268,206
%	a/b	5.2%	7.6%	6.4%	9.6%	5.9%	8.6%		
Prepared Shrimp	c	23,094	290.985	24,844	299.836	27,736	303.402	28,789	34,572
Fresh, frozen and prepared total	b+c	290,775	3,263.354	263,995	2,861.111	275,412	2,785.158	252,679	302,778
%	c/b+c	7.9%	8.9%	9.4%	10.5%	10.1%	10.9%	11.4%	11.4%

Cuttlefish and squid

		1997		1998		1999		2000 (1-11)	
		Q (tons)	V (1000\$)	Q (tons)	V (1000\$)	Q (tons)	V (1000\$)	Q (tons)	V (1000\$)
Fresh and frozen fillet	a	49,370		42,840		51,182			
Fresh and frozen total	b	95,647	448,683	93,378	399,210	105,909	431,272	91,248	43,259
%	a/b	51.6%		45.9%		48.9%			
Prepared cuttlefish and squid	c	11,445	61,466	9,523	48,826	12,843	65,170	20,869	9,780
Fresh, frozen and prepared Cuttlefish and squid	b+c	107,092	510,149	102,901	448,036	118,752	496,442	112,117	53,039
%	c/b+c	10.7%	12.0%	9.3%	10.9%	10.8%	13.1%	18.6%	18.4%

Value added products are IQF/IQF Blanched, Stretched/Skewed Prawn, PD Tail-on, Breaded & battered, Stuffed squid, seafood mix etc. and including packaging.

The Results' Change of Main Fishery Items' Imports from India

Quantity : Ton
Value : 1000 US\$

	1994		1995		1996		1997		1998		1999		2000 (Jan - Nov)	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Yen(.....)
Fresh, chilled or frozen														
Tuna and Warlin	570	3,002	722	3,100	4	15	4	17			61	149	41	6
Largehead hairtail	50	103	72	141	90	169	196	381			1	2		
Blue drum	20	42	49	89	630	1,386	1,167	2,693	915	1,450	1,127	2,321	877	193
Surimi of Threadfin bream	102	253	478	1,306	277	469	2,786	5,232	3,375	4,731	5,857	9,739	6,611	1,228
Spiny lobster	936	11,904	110	11,995	752	9,733	883	10,500	717	6,999	673	7,736	864	1,246
Shrimps and prawns	44,119	484,911	45,593	506,592	55,471	550,231	58,115	607,446	50,411	541,482	52,756	495,101	45,217	52,199
Crab	1,525	5,119	619	2,292	760	3,101	866	3,008	1,493	4,312	601	1,748	1,986	815
Cuttlefish	1,486	7,308	1,891	10,884	3,184	14,334	2,800	10,662	3,142	9,885	2,079	7,466	1,158	482
Squid	1,722	8,671	1,874	11,111	3,100	16,350	3,100	15,188	2,338	10,914	2,434	9,669	1,792	837
Jelly fish and Trepang	157	264	575	1,265	2,359	6,118	477	1,027	558	980	791	1,317	955	167
Octopus	256	409	71	128	36	58	99	231	83	168	22	30		
Prepared or preserved														
Crab			1	17	10	127			4		14	18		
Shrimps and lobsters	187	2,601	246	7,544	355	7,236	155	4,079	190	6,581	140	5,155	254	1,112
Cuttlefish	180	570	244	986	301	1,229	380	1,578	146	586	269	928	34	
Fish meal														
Pearls	(214 kg)	1,509	(242 kg)	932	(202 kg)	1,707	(186 kg)	(185KG)	598	707	(112 kg)	354	(123 kg)	37
Others	2,762	13,181	2,675	14,232	3,024	11,121	4,525	12,358	1,846	7,230	2,296	9,409	2,141	830
Total Imports Value (A)	54,181	539,127	56,020	572,622	70,541	622,857	75,362	674,600	65,218	596,019	89,107	552,123	62,149	89,252
Total Value of Japan (B)	3,294,893	16,753,566	3,581,099	18,444,744	3,449,053	17,635,764	3,410,935	16,178,184	3,102,566	13,275,830	3,415,479	15,247,965	3,193,849	1,589,851
(A)/(B)	1.64%	3.22%	1.56%	3.10%	2.05%	3.53%	2.21%	4.17%	2.10%	4.49%	2.02%	3.62%	1.94%	3.72%

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As to Shrimp, recently Japanese people like Peeled Tail-on shrimp. Those are used for Tempura or fried in oil. The demand of CP (Cooked and Peeled) Fan Tail Butterfly Shrimp (Peeled Tail-on Butterfly) is growing.

As to Squid, Japan like the form of Double Skinned. You should pay attention to the dine-out industry, such as Kaiten-sushi which are popular in Japan, restaurants and so on, because the demand of seafood mix (mixed Squid, Shrimp, Shell and like that in it) for such business use is growing. This is why the Japanese consumers have a taste for somewhat processed fishery products.

And there is another reason why we want to reduce the cost of fishery products to process. For one thing, the Japanese personnel expense is very high. Another thing is that cost of production in India or Vietnam is much lower than of Japan.

First of all, you should be good to supply the high quality fishery prod-

ucts. For that, you should process the fishery products immediately from the time when you catch in the sea or land the cultivated one from the pond.

The second is, in order that Japanese may eat the good tasty fishery products easily in their house, you should freeze them in the smaller block which is easy to subdivide. For example, if you freeze them, you would better do so in block of, say 500 gm or so, not of 1.8 kilo gram. And the third, you would process them in value added form within your country, India. Further, the safety of fishery products is a matter of great concern. And certain things against the business morality like non-delivery are far from acceptable.

These are the principal points. If you take care of these things, then your export to Japan will be growing more. JMPIA would like to talk with the Indian exporters and the Japanese importers together, on these matters so as to help improve our mutual trade.

The specific quality requirement for

value added products; should also be taken care of i.e., the raw material quality right from the catching ground, i.e. on-board handling and preservation, transportation in insulated containers, handling at landing centres and pre-processing plants, sorting cleaning and packing at processing plants, avoiding foreign matter (incidence of nails, clips, stapler pins, hair etc. as recently reported, other than the anti-biotic residue which are disturbing the minds of importers in Japan) are the areas of concern.

Therefore future of exploiting the market for value added items will depend on improving the quality levels of handling and processing for maintaining a consistent quality at all stages to deliver a wholesome product, which the buyers can order blindly with any producer in India.

** Executive Managing Director*

JMPIA: This was a paper presented by Mr. Shimomura during the India International Seafood Show.

Tuna fetches 20 million

A single Tuna fetched a record 20.2 million Yen at the New year's first auction on 5th January 2001, at Tsukiji Uoichiba Co., Tokyo's biggest fish market for marine product wholesalers, Tsukiji officials said. The 202kg. Bluefin tuna, caught in the Strait of Tsugaru, off Aomori Prefecture, Japan, was purchased by a middleman, who told reporters after the auction, "I just wanted to buy the highest quality tuna".

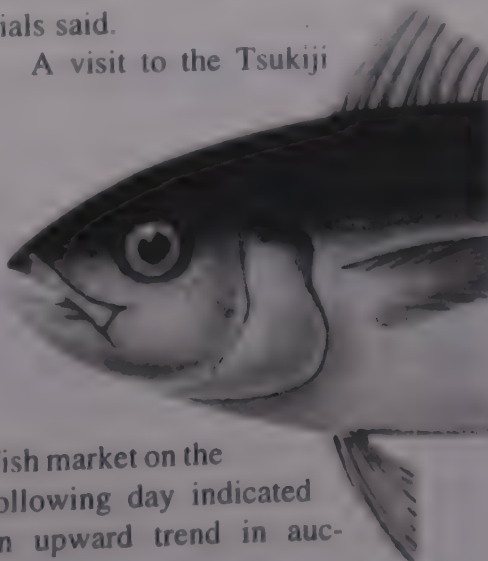
The auction, which kicked off at 4.50 a.m. with a chant by an auction leader and hand signaling by the middlemen, was the first in January and the first of the 21st century. The market place was awash with middlemen and several banners that read "Congratulations on the year's first arrivals".

The fish, which arrived at the marine product division of the Tsukiji marketplace, totaled 2,459 tons, a notch above

the first cargo that arrived for last year's first auction. The products included about 4,000 Tuna.

The record price for the Bluefin, a fish that ends up being consumed as Sushi in Japanese restaurants, also translates into a record high per-kg price of 100,000 Yen, the officials said.

A visit to the Tsukiji



Fish market on the following day indicated an upward trend in auc-

tioned price for all varieties of prawn and fish. The secondary wholesale shops had a brisk business after almost five-six days of holidays. However, some of the items, say like shrimps, crab, salmon, pomfrets, seerfish, were on short supply & therefore sold at higher rates, when compared to previous week. The market was in jubilant mood for the New Year sales. 2001 will be promising for seafood trade, if we can act promptly against the business enquiries/contracts and ensure consistent supply of quality products. It has to be, repeatedly mentioned that Japanese people are very critical about product appearance and quality. As the popular saying goes "The Japanese people eat through their eyes".

(Source: "Japan Times" & Tsukiji Fish Market)



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Effect of Environmental Hazards on the seafood export of India

P.T. Lakshmanan, Liju Francis, Prafulla V. and M.K. Mukundan*

As a major seafood exporting nation, India is very much concerned with the quality of aquatic environment and safety of seafood products. With the introduction of EU directive on seafood, 91/493/EEC and the US regulations, monitoring of chemical hazards like toxic metals, pesticides, bio toxins etc. has become mandatory. Toxic metals Cd, Hg, Pb, Cu, Cr, Zn, Ni, As etc. were monitored in various seafood products and levels reported. Overall mean value of metals in various fishery products were far below the limit. Hg was <0.1 ppm in >98% of the samples.

Elevated levels of Cd, Zn, Cu have been observed in whole soft parts of squid and cuttlefish. Total mercury (Hg) exceeded 1.0 ppm in a few samples of marlin and swordfish. Cadmium content exceeded the limit of 3 ppm in around 10% of cephalopods, when the whole soft parts were analysed. Geographical variations were also observed in metal levels. In the light of the results obtained the need for constituting a GIS for trace metals is emphasized which would greatly help the seafood industry and boost export.

India's trade in fish and fishery products has steadily increased in recent years and has reached around 3 lakhs M.Tons valuing 1189 million US\$ in 1999-2000. On a global level India's contribution to the production of seafood is significant. The export of fish and fishery products during 1998-2000 is illustrated in Fig.1. The seafood industry has adopted modernisation and engaged in diversification and value additions and exporting the products all over the world. Along with this there has been an increasing concern over the safety of food items which may

contain pesticide residues, harmful chemicals, heavy metals, bio-toxins, pathogenic organisms etc. causing health hazards. Environmental contaminants not only endanger fish resources



but can reach human body through seafood. Safety of seafood and consumers health are of paramount importance. Many instances of heavy metal poisoning are reported, worldwide. The Codex Alimentarius Commission of the UN aims at global consumers health and economic interests and fair practices in the trade of food. To meet the global challenges in seafood trade, we need to ensure that our fish products are both safe and comply with International quality requirements and standards. So, monitoring of environment and fishery products for food contaminants are mandatory requirements for food safety and fair trade practices.

Many instances of high levels of toxic metals in fish and fishery products have been reported. Higher levels of Cd, Pb, Cu and Hg were noticed in visceral and mantle tissues of bivalve mussels from Chilean coast. Scallops and oysters from Australian coasts showed higher levels of Cd in the range of 0.41-1.44 mg/100g and 0.177-9.2 mg/100g (wet wt), respectively in edible parts. Analysis of seafood of the Mediterranean coast of Spain revealed high

content of Cd in squid, shrimp and related species. More than 50% of squid and cuttlefish exported to Italy had Cd content in excess of the tolerance limited (Cantoni et. al). Higher

levels of Pb contamination was observed in dried fish from Nigeria (Food Safety, 1995). Oysters collected from an estuary in Taiwan in 1989 were green in colour due to high concentrations of Cu, Highest concentration recorded was 4.4 mg Cu/g and oysters from other estuaries of Taiwan had Cu in the range of 67.8-682 mg/g. Taiwanese consuming 4g oysters daily would

result in Cu intake of about 12.6 mg, about 14 times the safe dietary levels suggested by FAO/WHO. Fairly high levels of Hg was found in a recent survey of 449 fish from the Canary island and also from South America due to pollution from gold miners. High concentrations of Hg was found in tuna, marlin and swordfish particularly large size collected from most parts of the world. The levels of toxic metals found in the major species of the world are presented in Table 2. The Indian marine products export suffered a setback in the late 80's and also recently on the ground that some consignments were contaminated with pathogens or heavy metals like Cd.

Objective of the Study

The objectives of the study are

- (i) To monitor the levels of toxic trace metals in the major seafood item to protect consumer health and promote fair trade practices.
- (ii) To develop high quality background values for trace metals in fish and shellfish as there is dearth of information about this and to provide an



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TABLE I

Common Name	Scientific Name	No. of Samples
Prawns	Assorted	48
Cuttlefish	Sepia pharonis	46
Squid	Loligo duvauceli	38
Rock lobster	Panulirus homarus	9
Mud crab	Scylla serrata	18
Mussel	Perna viridis	14
Clams	Villorita Cyprinoides	11
Tuna	Ethynnus affinis	12
Marlin	Makairo indica	11
Seer fish	Scomberomorus commersoni	9
Mackerel	Rastrellinger Kanagurta	8
White pomfret	Pampus argenteus	7
Oyster	Crassostrea madrasensis	20

early warning to the industry.

(iii) To evaluate the elemental concentration in the major seafood items as affected by environmental pollution, if any and also affecting seafood export.

Materials and Methods

Materials:- Raw or frozen samples of major seafood of export, viz., prawns, lobsters, mudcrab, cephalopods (mainly squid and cuttlefish), bivalve molluscs (clams, mussels and oysters) were collected at random from fish processing units/landing centres at Cochin, Quilon

and Mangalore. Squid and cuttlefish samples were purchased from the retail outlets of Integrated Fisheries Project, Cochin. Sample details are given below.

Material preparation

Edible meat/muscle was separated, finely chopped and homogenised for metal analysis. Homogenised meat was digested immediately or kept frozen until analysis.

Reagents and digestion procedure

Water of conductivity

18.2mS from Milli 'Q' - Reagent water system was used.

Mineral acids AnalaR grade acids from Glaxo-BDH were used.

Metal ion Standards Commercially available AAS grade metal standard obtained from sigma chemical Co. USA were used for calibration.

Wet digestion Wet digestion was carried out using conc. HNO₃ and HClO₄ mixture as per AOAC (1990) procedure.

For the determination of Hg, samples were digested in a closed system (Bethge's apparatus) using conc. HNO₃ and H₂SO₄ in the ratio 4:1 (v/v).

All glasswares / plastics bottles etc. were carefully cleaned and soaked in nitric acid / water and finally rinsed with distilled water.

Determination of metals were carried out by flame AAS by direct aspiration or by ICP using pure argon gas and mercury by Cold Vapour AAS techniques using a Mercury Analyser. Results are expressed in wet wt. basis.

Results and Discussion

The result of the study are presented (in Tables 2 to 5), the overall mean values of trace metals in various finfish

Table 2. Heavy metals in some of the seafood products of the world (in ppm wet/drywt. basis)

Fish/Product	Mercury	Cadmium	Lead	Copper	Zinc	Reference/Country
Pomfret (<i>Apolectus miger</i>)	0.13	0.05	0.18	2.26	0.08	Prudente et al, 1997
Mullet (<i>Valamugil sihali</i>)	0.05	0.01	0.30	2.84	0.06	Manila Bay, Phillipine
Snapper (<i>Lutjanus russel</i>)	-	0.11	0.10	1.19	0.04	
Squid (<i>Loligo opalescens</i>)	-	0.91 (0.65-1.30)	0.27 (0.03-1.0)	24 (13-43)	17 (11-24)	Falandysz, 1991 Italy
Fin fish	0.4 (0.03-0.67)	0.1 (0.003-0.12)	0.4 (0.06-1.6)	-	-	Ramelovu, 1989 (Louisiana, USA)
Fin fish	0.13 (0.51-2.4)	0.32 (0.19-0.73)	4.12 (2.4-16)	-	-	Tariq et. al., 1993 (Pakistan)
Fin fish	-	0.03 (0.02-0.05)	0.05 (0.03-0.07)	-	-	Ikeb et.al., 1991 (Osdaka, Japan)
Rabbit fish	-	33 (0.6-7.1)	19 (6.0-40.3)	5.7 (0.6-73.5)	66.6 (14.9-347.6)	King Ming, Chang, 1990, Hong Kong
	42	18.6	199	-	516	Tasmania
Mussel	0.47	32	0.8	96	91	USA
Oyster						

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Table 3. The levels of some of the toxic trace metals in the major seafood (fin fish) export of India (mean, and range, mg/kg, wet

Item	Mercury	Cadmium	Lead	Copper	Zinc	Chromium
Mackerel	0.015 (0.009-0.021)	0.02 (0-0.07)	0 (Nil)	0.600 (0.38-0.76)	3.85 (3.46-4.42)	2.64 (2.30-3.03)
Pomfret, white	0.021 (0.019-0.024)	0.026 (0-0.044)	0 (Nil)	0.027 (0-0.63)	2.385 (2.343-2.42)	-
Seerfish	0.026 (0.015-0.042)	0.098 (0-0.29)	0.252 (0-0.81)	0.634 (0.05-2.02)	3.78 (1.67-6.37)	2.26 (2.03-2.56)
Sardine	0.054 (0.022-0.088)	Nil	0.28 (0-0.67)	2.126 (1.22-3.02)	31.43 (28-35.01)	-
Marlin	1.57 (1.05-2.27)	0.37 (0.28-0.49)	Nil	Nil	7.41 (6.98-7.74)	-
Tuna	0.186 (0.13-0.23)	0.26 (0.15-0.367)	Nil	0.42 (0.28-0.64)	-	0.39 (0.250-0.489)

and shellfish and their range are also given. The levels of highly toxic metals, viz., Hg, Cd, Pb found in Cephalopods are also given for different geographical locations as well as for whole soft parts and edible muscle separately, in order to understand geographical variations, if any, as well as the reduction which could be obtained in metal levels on removing visceral mass.

Of the 48 samples of shrimp analysed, Hg in various prawn product were <0.10 ppm and ranged between 0.01-0.06 ppm. In the edible muscle of squid and cuttlefish Hg was <0.075 ppm when 84 samples were analysed. Highest Hg was observed in few samples of tune, marlin and crab meat with

values ranging from 0.092-0.023 ppm (in tuna) 0.54-2.27 ppm (in marlin), and 0.08-0.37 ppm (in crab meat). Except two large specimens of marlin, none of the samples had Hg above the limit of 1.0 ppm. However an increasing trend of EHg was seen with size of marlin and tuna.

The present levels of Hg in the various fish and fishery products, are comparable with the results obtained earlier by MPEDA (1984). The highest value observed for Hg was 2.27 ppm in a large specimen of marlin. The higher levels of Hg in marlin and an increasing trend with size in tuna indicated an accumulation of Hg with time. The levels of Hg found in Indian fishes were definitely lower than the values

reported from other parts of the globe (Table 3) and also from Belgium and fishes from Manila Bay.

The presence of Cd in seafood is of serious concern due to its cumulative effect and toxicity. In the present study, the concentration of Cd in the edible muscle of various finfish and shellfish products were <1.0 ppm except in oysters and mussels where the upper limit was 3.65 and 1.32 ppm, respectively. However, the level of Cd was far below the permissible limit in all the finfish samples. In shrimp, crab meat and lobster tails Cd content was <0.35 ppm and often-undetectable in prawns. Cd content in the edible muscle of squid and cuttlefish ranged between 0.60-0.95 ppm.

Table 4. The levels of some of the toxic trace metals in the major seafood (shell fish) export of India (mean, and range, mg/kg wet wt. basis

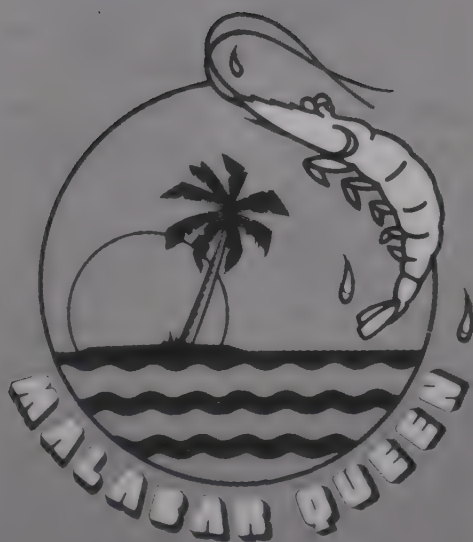
Item	Mercury	Cadmium	Lead	Copper	Zinc	Chromium
Shrimp (Assorted)	0.03 (0.021-0.049)	0.146 (0-0.355)	N.D.	1.62 (0.211-1.624)	9.29 (6.80-13.78)	N.D.
Whole Crab	0.121 (0.100-0.37)	0.20 (0.068-0.356)	0.49 (0-0.956)	21.11 (6.8-57.49)	49.02	N.D.
Lobsters	0.063 (0-0.084)	0.071 (0.13-0.248)	0.255 (0-0.587)	3.20 (3.02-3.34)	10.14 (9.41-12.61)	N.D.
Squid tube	0.038 (0.012-0.073)	0.233 (0.074-0.685)	1.134 (0.281-1.764)	2.825 (0.50-4.81)	12.04 (4.55-24.06)	3.352 (2.257-4.519)
Cuttlefish, fillet	0.032 (0.008-0.06)	0.40 (0.10-0.90)	0.71 (0-6.3)	1.62 (0.37-4.69)	10.66 (6.34-22.24)	10.64 (7.64-14.67)
Oysters	0.063 (0.044-0.91)	2.683 (1.924-3.649)	0.304 (0-0.986)	21.74 (16.10-30.71)	1101 (786-1954)	N.D.
Mussels	0.038 (0.02-0.049)	0.703 (0.27-1.622)	0.386 (0-0.56)	1.099 (0.688-1.615)	4.86 (3.91-5.59)	0.178 (0-0.406)
Clams	0.026 (0.021-0.031)	0.25 (0.13-0.334)	0.219 (0-0.678)	5.08 (2.887-6.59)	15.66 (11.46-18.65)	5.12 (4.326-7.10)

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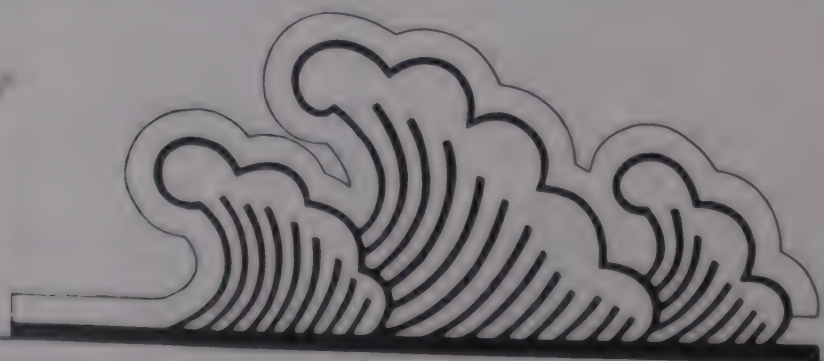


Table 5. Metal levels in squid and cuttlefish collected from different geographical locations (Expressed in mg/kg wet wt basis)

Cochin Region					
Item	Mercury	Cadmium	Copper	Zinc	Lead
Whole Squid	0.03-0.09	0.46-3.19	2.86-12.78	6.25-16.24	0.45-1.80
Muscle	0.01-0.07	0.04-0.94	0.73-13.80	3.52-24.44	0-1.00
Cuttlefish whole	0.04-0.10	1.57-6.13	5.14-14.22	1.15-10.60	0.45-0.79
Muscle	0-0.37	0.087-0.51	0.49-4.04	6.03-15.51	0.15-1.61
QUILON REGION					
Squid Muscle	0.02-0.04	0.19-1.02	0.78-2.54	4.84-32.41	0.33-1.58
Cuttlefish muscle	0.01-0.03	0.16-0.50	0.99-3.70	7.83-11.76	0.01-1.01
MANGALORE REGION					
Squid Muscle	0.01-0.04	0.18-0.092	0.15-8.39	4.55-14.61	0-1.83
Cuttlefish Muscle	0-0.02	0.01-0.15	0.62-1.75	8.17-10.40	0-0.95
MUMBAI REGION					
Whole Squid	0-0.07	0.73-0.85	1.45-2.50	3.27-3.31	-
Muscle	0.002-0.01	0-0.250	0.05-1.15	5.57-7.63	-
Cuttlefish whole	0.06-0.09	12.06-17.7	32.14-51.02	19.19-27.28	-
Muscle	0.002-0.06	0.47-1.35	0.44-3.07	9.06-182.58	-

However Cd level exceeded the tolerance limit of 3 ppm in around 10% of squid and cuttlefish samples when the whole soft parts were analysed for the metal indicating contribution from the visceral part, particularly the liver. Whole soft parts of squid and cuttlefish had always higher levels of Cd and other toxic metals compared to muscle values. 40-70% reduction in metal level could be obtained on conversion of whole animal in to tubes or fillets. The rejection or retention experienced by cephalopod products due to the presence of higher levels of Cd was mainly of whole squid/cuttlefish and also whole cleaned samples where liver fragments contaminated the products and gave higher values for Cd. The present study clearly indicated significant reduction in the level of Cd and similar metals on converting to fillets or tubes (Table-5). The study also indicated significant geographical variations in metal levels when squid and cuttlefish were analysed, from different locations (Table-5).

High levels of Cd in Cephalopods have been reported by other workers also (Falandysz, 1991). Contoni et. al. 1986 observed that 50% of the squid

and cuttlefish exported to Italy had Cd content in excess of the tolerance limit of that country. High levels of Cd has also been reported in Arctic marine mammals.

In general, the levels of Pb was always higher in shellfish than in finfish (Tables 3&4). However, some instances of higher Pb level were observed in squid and cuttlefish probably due to contamination either from environment or by selective uptake from the diet. Pb could not be detected in any of the shrimp products and finfishes like pomfret, tuna, mackerel and marlin. In other products the lower range was always zero and the upper level was <1 ppm. This inference indicated that the fish from Arabian sea is practically devoid of Pb and hence do not adversely affect our marine products export.

The levels of As in Indian fishery products are not present at alarming levels (Table 4). Often they are below the limit of FDA Guidance levels. Arsenic in cuttlefish and calam meat is around 15 ppm, ie. far below the FDA limit of 76 & 80 ppm.

Cu content was found to be <1.0 ppm in all the finfish species examined,

except in sardine were the upper limit was 3.02 ppm - while Cu concentration in shellfish were comparatively higher and exceeding 10 ppm in squid, crab meat and oyster (Table 4). On the whole the levels of Cu ranged from 0.37-30.7 ppm in shell fish. However, crabmeat had higher levels of Cu (7.5-15.4 ppm) and Zn (24.1-89.2 ppm), probably contributed by the haemocyanin of its blood. However no rejection of marine products as a result of higher levels of Cu were observed in L. opalescence (Falandysz, 1991). Significantly, large accumulation of Cu, Zn and Pb were found in fishes, mussels and barnacles from Victoria Harbour. Very high levels of Zn were found in oysters, in the present study which are not observed in any other fish/shellfish species.

Distribution of Zn in the various fishery products of India showed that, the level of Zn was normal in all the products except in crabmeat and oysters where it is quite high, probably due to Zinc-metalloenzymes present in the animal. Both Cu and Zn are essential elements and the present level of these metals in Indian seafood products are normal and did not seem to contribute

Table 6. Environmental Chemical Contaminants, Tolerances, Action Levels and Guidance Levels as per FDA and EU regulations

Toxic elements	Limit as per FDA ppm	Food Commodity	Limits as per EU norms (For all marine products) mg/kg
Arsenic	76	Crustacea	-
	86	Molluscan bivalves	0.5-3.0*
Cadmium	3	Crustacea	-
	4	Molluscan bivalves	0.5-10.0*
Chromium	12	Crustacea	-
	13	Molluscan bivalves	1.0
Lead	15	Crustacea	50
	1.6	Molluscan bivalves	-
Nickel	70	Crustacea	-
	80	Molluscan bivalves	-
Mercury	1.0	All fish	-
	-	-	-
Zinc	-	-	-

* Varying between EU countries

any consumer health hazards or unacceptability.

Chromium (III) as part of the human glucose tolerance factor was identified as an essential micronutrient for mammals. In the present study the highest value for chromium was found in clam (4.3 to 7.1 ppm).

The values of various trace metals found in Indian seafood can be compared with the results obtained for other fish species around the globe (Table 2). The levels of other toxic metals are relatively low and did not seem to contribute any consumer health hazard.

The present study showed that, in general, the average concentration of all the metals were significantly lower in the edible parts of all the fish / shellfish analysed. Marlin had generally, higher levels of Hg, and two cases of large specimen of marlin (>10 Kg) had Hg content above 1 ppm. In whole cephalopods and very rarely in whole cleaned cephalopods also the level of Cd exceeded 3 ppm, the recommended limit which resulted in retention or rejection from European market. Otherwise, the levels of toxic elements were not present in any of the fishery product to affect our fishery export. The study emphasize the need for the removal of the liver and visceral components of

cephalopods before processed for human consumption. In the case of higher Hg content in marlin, further investigation is called for. Good hygiene practice

and a clean ocean will provide us safe food and promote fair global trade.

*Central Institute of Fisheries Technology, Matsyapuri P.O., Cochin- 29

Australia initiates...

Contd. from page 13

- prawns to the kg). Please note, consignments with graded counts higher than 29 to the pound may be intended for human consumption, however could be diverted for sale as bait, therefore these consignments should be referred to the Biologicals Unit for clearance
- Accompanied by a commercial invoice indicating a relatively high value (as a rough guide it would be above AUD\$10/kg)
- Packed into boxes of consistent size and weight and with clear markings and
- Free from by-catch and extraneous matter
- Free from significant lesions (abnormal markings on the shell), would not have black, loose, detached, or hollow heads (can not easily push in the sides of the head) (may be difficult if frozen)

Clearance procedure for imported headless unpeeled green prawns

Headless unpeeled green prawns for human consumption would reasonably be expected to be:

- Graded so that they were consistent in size
- In packaging/boxes marked with the graded count size,
- Accompanied by a commercial invoice indicating a relatively high value (as a rough guide it would be above AUD\$10/kg)
- Packed into boxes of consistent size and weight and with clear markings and
- Free from by-catch and extraneous matter

Release from quarantine

Imported peeled, whole green or headless prawns may be released if the consignment satisfies the relevant criteria. If the imported prawns do not meet the criteria, the consignment cannot be released and the Biological Unit in Canberra should be contacted on 02 6272 4578.

Contact: Biologicals Unit, AQIS
Telephone no: 02 6272 4578
Facsimile no: 02 6273 2097
E-mail: biologicals @aqis.gov.au

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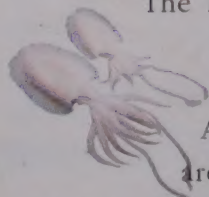
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